

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Appeal No. _____

BRIEF FOR APPELLANTS

Ex parte Katsutomo Terashima et al.

EXCIMER LASER DEVICE AND GAS FOR EXCIMER DEVICE

Serial No. 09/434,024, filed November 4, 1999

Examiner: Cornelius H. Jackson

Group Art Unit: 2881

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R. Eugene Varndell, Jr.
Attorney for Appellant

VARNDELL & VARNDELL, PLLC
106-A South Columbus Street
Alexandria, VA 22314



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I. INTRODUCTION

This is an appeal from the final rejection of claim 40-52. The final Office action mailed February 11, 2004, set forth two different prior art rejections of applicant's claims.

II. REAL PARTY IN INTEREST

The real party in interest is the owner of this application. At the time of the filing of this brief, the present application was owned by the assignee, Komatsu, Ltd.

III. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences that either directly affect or have a bearing on the decision in this appeal. The present application is a continued prosecution application (CPA) of U.S. serial No. 09/434,024, filed on June 26, 2003; which is a continued prosecution application (CPA) of U.S. serial No. 09/434,024, filed on May 2, 2002. The original application, U.S. serial No. 09/434,024, was filed on November 4, 1999.

IV. STATUS OF CLAIMS

Claims 1-39 were canceled. Claims 40-52 are the only claims pending in the application at the time of appeal. Claims 40-44 and 49-52 stand finally rejected under 35 U.S.C. § 102(e). Claims 45-48 stand finally rejected under 35 U.S.C. § 103(a). Claims 40-48 and 51-52 were present in the application before the final Office action was issued, and no amendment was made to these claims after the final rejection. Claims 49 and 50 were amended in a response after final filed on June 10, 2004, to correct minor objections thereto. The Advisory Action mailed July 14, 2004, stated that the amendments to claims 49 and 50 set forth in the response after final filed on June 10, 2004, will be entered into the application for the purposes of appeal.

V. STATUS OF AMENDMENTS

There are outstanding amendments to claims 49 and 50 on appeal. As mentioned above, the Advisory Action mailed July 14, 2004, stated that the amendments to claims 49 and 50, which were set forth in the response after final filed on June 10, 2004, will be entered into the application for the purposes of appeal. Claims 40-52 including the amendments to claims 49 and 50 set forth in the response after final filed on June 10, 2004, are set forth in the attached appendix.

VI. SUMMARY OF THE INVENTION

The presently claimed invention relates to an excimer laser and an excimer laser output control method, where xenon gas in an amount of approximately 10 ppm is provided in the laser chamber device together with the laser gas, whereby the laser chamber device operates to maximize an output energy of excimer laser and minimize a dispersion of the output energy. The laser gas includes Kr and Ar, a buffer gas of Ne, and a halogen gas. The claimed invention includes, *inter alia*, multiple structures and methods for supplying the xenon gas into the laser chamber device and multiple structures and methods for detecting the concentration of xenon gas in the laser chamber device.

VII. THE REFERENCES

The following U.S. patents were cited as references against appellant's claims in the final Office action:

U.S. patent No. 6,014,398 of Hofmann *et al.*, patented January 11, 2000 (hereinafter referred to as "Hofmann"), and

U.S. patent No. 6,130,904 of Ishihara *et al.*, patented October 10, 2000 (hereinafter referred to as "Ishihara").

In its summary, Hoffman explains that the invention proposed therein provides a very narrow band pulse excimer laser capable of producing pulses at a rate in the range of about 500 to 2000 Hz with enhanced energy dose control and reproducibility. Very small quantities of a stabilizing additive consisting of oxygen or a heavy noble gas (xenon or radon for KrF lasers, or krypton, xenon or radon for ArF lasers), are added to the gas mixture. Tests performed show substantial improvements in energy stability with the addition of about 30 ppm of xenon to a KrF laser. Tests show improved performance for the ArF lasers with the addition of about 6-10 ppm of Xe or 40 ppm of Kr. In a preferred embodiment very narrow bandwidth is achieved on a KrF laser by reducing fluorine partial pressure to less than 0.10 percent and by increasing the reflectance of the output coupler to greater than 25 percent. The teachings of Hoffman are concerned with experiments using small amounts of laser gas additives, such as oxygen, xenon, radon and krypton; but have little discussion concerning the structure of the excimer laser proposed therein.

The teachings of Ishihara propose a gas supplementation method of excimer laser apparatus. The block diagram shown in Fig. 1 of Ishihara includes a fluorine concentration monitor 12 and a pressure monitor 13. The teachings of Ishihara have absolutely no discussion therein concerning xenon gas.

VIII. ISSUES

The issues on appeal are:

(1) Whether claims 40-44 and 49-52 are anticipated by the teachings of Hoffman under 35 U.S.C. § 102(e)?

(2) Whether claims 45-48 would have been obvious at the time of the invention under 35 U.S.C. § 103(a) over the teachings of Hoffman in view of Ishihara?

IX. THE FINAL REJECTION

The final Office action set forth two prior art rejections of applicant's claims. Claims 40-44 and 49-52 were rejected under 35 U.S.C. 102(e) as being anticipated by Hofmann. Regarding claim 40, the examiner stated that Hofmann discloses an excimer laser comprising a chamber device 10, a gas mixture sealed in the chamber device 10, the gas mixture being composed of a rare gas selected from the group consisting of Kr and Ar, a buffer gas of Ne, and a halogen gas (noting col. 9, lines 40-50, and claims 1, 2 and 5 of Hoffman); gas supply means for supplying the mixture gas to the chamber device (it is inherent that the gas mixture is supplied to the chamber by some means) and means for carrying out pulse oscillation (noting col. 3, line 24, to

col. 4, line 67 of Hoffman) in the chamber device 10 by discharges across discharge electrodes to excite the gas mixture to oscillate a pulsed laser; wherein a predetermined amount of Xe gas having a concentration of approximately 10 ppm is supplied from xenon gas supply means to the gas mixture in the chamber device (noting abstract, col. 2, lines 25-43, and col. 10, lines 23-30, of Hoffman), whereby the chamber device 10 operates to maximize an output energy of the laser and minimize a dispersion of the output energy.

Regarding claim 41, the examiner noted that Hofmann discloses all the stated limitations, noting claims 1, 2 and 5 of Hoffman. Regarding claims 42-44, the examiner took position that it is inherent that the device disclosed by Hofmann uses the method as claimed, and therefore, the method is rejected on the same basis as the device. Regarding claims 49-52, the examiner stated that Hofmann discloses all the stated limitations, noting col. 9, lines 50-55, of Hoffman.

Claims 45-48 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hofmann in view of Ishihara. Regarding claims 45-48, the examiner stated that Hofmann as applied to claims 40-44 and 49-52 above, teaches all the stated limitations except for an xenon sensor means for detecting an amount of xenon within the chamber device and a controller for controlling the amount of xenon supplied to the chamber. The teachings of

Ishihara were cited as showing a sensor means 12 and/or 13 for detecting an amount within the chamber device and a controller 10 for controlling the amount of xenon supplied to the chamber. The examiner concluded that would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the sensor means and the controller as taught in Ishihara in the gas system of Hofmann such that the amount of Xe fed into laser chamber is a prescribed amount, noting col. 8, lines 36-58, of Ishihara.

The final Office action continued that applicant's arguments filed November 6, 2003, were fully considered but were not persuasive. The examiner characterize applicant's arguments as follows:

- a. Hofmann does not disclose every aspect of the invention as set forth in the present claims, e.g. the teachings of Hofmann do not explain how xenon is supplied therein.
- b. Hofmann is rebutted and overcome by the unexpected advantages achieved by the presently claimed invention, e.g. the amounts of xenon gas in the laser gas mixture.
- c. The teachings of Hofmann also do not anticipate a method including a concentration sensing step for detecting the concentration of xenon.

- d. Hofmann proposes about 30 ppm of Xe for KrF lasers instead of 10 ppm.

In response, the examiner stated the following:

- a. Hofmann discloses every aspect of the invention as set forth in the present claims, since Hofmann teaches the novelty of applicant's invention, which is the addition of xenon gas into an excimer laser, and the operation of such lasers was known (common knowledge and within the skill of one ordinary) in the art at the time Hofmann filed for a patent.
- b. Hofmann teaches the unexpected advantages achieved by the presently claimed invention, e.g. the amounts of xenon gas in the laser gas mixture.
- c. It is inherent that Hofmann includes a concentration sensing step for detecting the concentration of xenon in order for Hofmann to know the concentration of xenon within the chamber.
- d. Hofmann proposes about 30 ppm of Xe (as an example see col. 7, line 20-col. 8, line 5) but recommends for KrF lasers less than 30-40 ppm and that a 8 ppm of xenon in a KrF laser would reduce pulse energy by 8%; noting, col. 9, lines 40-55 and col. 10, lines 26-30, of Hofmann.

X. GROUPING OF CLAIMS

None of the claims are grouped together. Separate arguments for the patentability of the claims on appeal are set forth below.

XI. ARGUMENTS

1. Introduction

Applicant respectfully submits that the teachings of Hoffman do not disclose every aspect of the invention as set forth in the present claims, and therefore, cannot anticipate the presently claimed invention within the meaning of 35 U.S.C. § 102(e). In addition, the teachings of Hoffman either alone or combined with those of Ishihara cannot establish a *prima facie* case of obviousness for the presently claimed invention within the meaning of 35 U.S.C. § 103(a). Further, applicant respectfully submits that any rejection based on obviousness over the teachings of Hoffman either alone or combined with those of Ishihara is rebutted and overcome by the unexpected advantages achieved by the presently claimed invention. Namely, the amounts of xenon gas in the laser gas mixture as presently claimed provides unexpected advantages and/or results that distinguish the invention claimed on appeal from the teachings of Hoffman and/or Ishihara. Therefore, applicant

respectfully submits that the presently claimed invention is patentable over these teachings within the meaning of 35 U.S.C. § 102 or 35 U.S.C. § 103.

2. The teachings of Hoffman do not contemplate or suggest any sequence of supplying a laser gas including xenon or structure therefor, and therefore, cannot anticipate these aspects of applicant's claimed invention.

The teachings of Hoffman never explain how xenon is supplied to the laser chamber. Therefore, these teachings cannot anticipate a device or method where (firstly) a gas mixture is supplied to a chamber device from gas supply means, and (secondly) xenon gas is supplied to the gas mixture in the chamber device, as required in claims 40 and 42. Claim 42 further requires that the gas mixture is sealed in the chamber device before xenon gas is supplied to the chamber device, which is not contemplated or suggested by the teachings of Hoffman. Similarly, the teachings of Hoffman cannot anticipate a device or method where (firstly) the gas mixture is supplied to gas supply means, (secondly) xenon gas is supplied from xenon gas means and mixed with the gas mixture within the gas supply means, and (thirdly) the gas mixture is supplied to the chamber device and sealed them the chamber device, as required in claim 41 and 44. In summary, since the teachings of Hoffman do not explain how xenon is supplied therein, these teachings cannot contemplate or suggest a specific sequence of supplying xenon gas to the gas mixture into

the chamber device or structure for supplying xenon gas to the gas mixture in the chamber device, as required in the present claims 40-44.

In response to the foregoing arguments, the examiner simply stated that the specific sequences of supplying xenon and the structures therefor, as set forth in the claims on appeal, are common knowledge and within the skill of the art.

Applicant (Appellant) respectfully submits that limitations in claims cannot be simply dismissed as common knowledge or within the skill of the art, and thus, considered to have no limiting effect when comparing the claim with a prior art reference, as alleged in the final Official action. This appears to be an attempt to circumvent basic patent principles laid down by the U.S. Supreme Court and the Court of Appeals for the Federal Circuit, which have repeatedly held that to ignore limitations in claims disregards several mainstay patent doctrines. See, e.g., *Continental Paper Bag Co. v. Eastern Paper Bag Co.*, 210 U.S. 405, 419 (1908) ("[T]he claims measure the invention."); *Pennwalt Corp. v. Durand-Wayland, Inc.*, 4 USPQ2d 1737 (Fed. Cir. 1987) (*in banc*), cert. denied, 485 U.S. 961, cert. denied, 485 U.S. 1009 (1988); *Perkin-Elmer Corp. v. Westinghouse Elec.*, 3 USPQ2d 1321 (Fed. Cir. 1987); *Lemelson v. United States*, 224 USPQ 526, 533 (Fed. Cir. 1985). Since the rejection of applicant's claims does not establish or show the common knowledge and the skill of the art

concerning the sequence of supplying xenon or structure therefor, as set forth in the claims on appeal, these method steps and structures cannot be anticipated or rendered obvious.

It is respectfully noted that the laser gases are often sold premixed in a single cylinder. In other words, it is common in the art for laser gas mixtures to be mixed separately from the laser apparatus. The teachings of Hoffman could use such a system and, in fact, discuss the use of preconditioned xenon-containing gas mixtures at col. 8, lines 52-54. For all these reasons, applicant respectfully submits that the teachings of Hoffman cannot contemplate or suggest a specific sequence of supplying xenon gas to the gas mixture in the chamber device or gas supply means for supplying xenon gas to the gas mixture in the chamber device provided within the laser apparatus, as required in present claims 40-44.

3. The teachings of Hoffman do not contemplate or suggest a concentration sensing step for detecting the concentration of xenon in the chamber device, as required in claim 43, and therefore, cannot anticipate this aspect of applicant's claimed invention.

The examiner acknowledged that the teachings of Hoffman do not show a concentration sensing step for detecting the concentration of xenon gas added to the gas mixture in the chamber device, as required in claim 43. It was the examiner's position that Hoffman inherently includes a concentration sensing

step for detecting the concentration of xenon in order for Hoffman to know the concentration of xenon within the chamber. This position is pure conjecture. There is no need for Hoffman to detect the concentration of xenon within the laser chamber therein, in order for Hoffman know the concentration therein. For example, the gas in the laser chamber could be exhausted and the concentration of xenon measured in the exhausted gas.

Perhaps, more importantly, the teachings of Hoffman explain that the concentration of xenon gas in the laser chamber 8 is not known. See, for example, the discussion in Hoffman at column 8, lines 41-68, which discusses conducting various test in order to determine the memory effect of xenon. The memory effect of xenon is believed to be the behavior of the laser, after the laser was operated with a xenon containing mixture and refilled without xenon. If the teachings of Hoffman contained a device or method step for measuring the concentration of xenon within the laser chamber, there would be no need for the teachings of Hoffman to carry out multiple tests to determine whether xenon physically remains in the chamber. Accordingly, the teachings of Hoffman do not and cannot inherently include a step for measuring xenon concentration in the laser chamber, as required in claim 43 on appeal.

Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is

not sufficient." *Cont'l Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1269, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991) (citations omitted). See also *In re Paine v. Inoue*, 195 USPQ 598, 600 (CCPA 1976); *In re Hansgrig v. Kemmer*, 40 USPQ 665 (CCPA 1939). Since there is no need for Hoffman to detect the concentration of xenon within the laser chamber therein and, in fact, the teachings of Hoffman require performing additional tests to determine the concentration of xenon within the laser chamber, the teachings of Hoffman do not and cannot inherently include a step for measuring xenon concentration in the laser chamber, as required in claim 43 on appeal.

4. The teachings of Hoffman do not contemplate or suggest the specific gas mixture required in claims 49-52 on appeal.

Claims 49-52 all require the combination of a gas mixture where the rare gas is Kr and approximately 10 ppm of xenon gas in the laser gas mixture for maximizing output energy of oscillated pulsed laser and minimizing dispersion of the output energy of the oscillated pulsed laser. With respect to KrF lasers, Hoffman proposes about 30 ppm of Xe.

The examiner stated that Hofmann proposes about 30 ppm of Xe (as an example see col. 7, line 20-col. 8, line 5) but recommends for KrF lasers less than 30-40 ppm and that a 8 ppm of xenon in a KrF laser would reduce pulse energy by 8%; noting, col. 9, lines 40-55, and col. 10, lines 26-30, of Hofmann.

However, applicant respectfully submits that these latter portions of Hoffman do not support the position proffered by the examiner. Hoffman at col. 9, lines 40-55, and col. 10, lines 26-30, is discussing noble gas additives in a ArF laser. In these discussions, the additives Kr and Xe are added to a typical ArF gas mixture. These discussions are not concerned with a KrF gas mixture, as required in claims 49-52 on appeal. Therefore, these discussions in Hoffman cannot contemplate or suggest amounts of xenon in a KrF laser gas, as required in claims 49-51 on appeal.

Perhaps, the examiner misconstrued the discussion in Hoffman at col. 9, lines 40-55. For example, Hoffman at col. 9, lines 51-52, states "As with the KrF laser, the additives reduced the output of the laser." However, this portion of Hoffman is simply referencing the KrF laser and making a comparison to the ArF laser as discussed in this paragraph at col. 9, lines 51-55. In other words, the concentrations of Xe and Kr discussed in the paragraph at col. 9, lines 51-55, of Hoffman are all concerned with additions to the ArF laser, not the KrF laser. Therefore, this portion of Hoffman cannot contemplate or suggest amounts of xenon in a KrF laser gas, as required in claims 49-51 on appeal.

For aforementioned reasons, the teachings of Hoffman cannot anticipate or render obvious the invention set forth in claims 49-52 on appeal.

5. The combined teachings of Hoffman and Ishihara do not contemplate or suggest the use of a xenon sensor for detecting the concentration of xenon in the chamber device, as required in claims 45-48 on appeal, and therefore cannot establish *prima facie* case of obviousness for these claims within the meaning of 35 U.S.C. §103(a).

Claims 45 and 46 are excimer laser claims and claims 47 and 48 are method claims that all require the gas supply means includes an xenon sensor means for detecting an amount of xenon within the chamber device, and a controller for controlling the amount of xenon supplied to the chamber device based on the detected amount of xenon in the chamber device by the xenon sensor means. The teachings of Hoffman do not anticipate or suggest this structure or a method of using this structure. The teachings of Ishihara do not cure or rectify this deficiency in the teachings of Hoffman.

In the rejection of claims 45-48, the final Office action included the teachings of Ishihara and stated that such teachings show a sensor means 12 and/or 13 for detecting an amount within the chamber device and a controller 10 for controlling the amount of xenon supplied to the chamber. The block diagram shown in Fig. 1 of Ishihara proposes a fluorine concentration monitor 12 and a pressure monitor 13. The teachings of Ishihara have absolutely no discussion therein concerning xenon gas. Since the teachings of Ishihara do not contemplate or suggest a sensor for detecting xenon concentration, one of ordinary skill in the art would not have been motivated by such teachings to

use a sensor for detecting xenon concentration in the device proposed by Hoffman.

Applicant respectfully submits that the statement in the final Official action concerning the addition of a xenon sensor in the device of Hoffman incorporates the impermissible use of hindsight reasoning to modify and combine the references in a manner required to meet the limitations of the claims. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). There is no suggestion or motivation in either Hoffman or Ishihara for combining these references in the manner required to meet each and every limitation of applicant's claims.

Perhaps, it is the examiner's position that one of ordinary skill in the art would change the fluorine concentration monitor 12 of Ishihara into a sensor for detecting xenon concentration, and then a substitute such a sensor into the teachings of Hoffman. However, applicant respectfully submits that there is no motivation for such a change and substitution within the teachings of Hoffman and Ishihara. It is respectfully noted that the teachings of Hoffman are concerned with minimizing the generation of metal fluorine contaminants due to the corrosive nature of the fluorine gas. See, for example, the discussion in Hoffman at column 3, lines 33-38. In addition, Hoffman explains that fluorine consumption in a discharge chamber is due to fluorine reaction with materials

in the chamber, which typically produce contaminants. See, for example, the discussion in Hoffman at column 5, lines 5-30. In order to minimize fluorine consumption, Hoffman proposes the use of specific materials in the laser structure. Similarly, the teachings of Hoffman teach away from use of additional materials within the laser chamber, in order to minimize contaminants produced by fluorine attack. Since the use of a xenon sensor within the laser chamber proposed by Hoffman will necessarily result in fluorine attack on the xenon sensor, typically producing contaminants, one of ordinary skill in the art would not be motivated to use such a sensor in the laser chamber of Hoffman. As explained by this honorable Board repeatedly, references cannot be properly combined if the effect would be to destroy the invention on which one of the referenced patents is based. *Ex parte Hartmann*, 186 USPQ 366 (P.T.O.Bd.Ap. 1974); *Ex parte Thompson*, 184 USPQ 588 (P.T.O.Bd.Ap. 1974). See also *In re Rosen* 213 USPQ 347 (CCPA 1982). Since the teachings of Hoffman desired to minimize fluorine consumption and resulting contaminants, these teachings require specific materials in the laser chamber and teach away from use of additional materials within the laser chamber that could cause contamination. Therefore, one of ordinary skill in the art would not be motivated to add additional materials into the laser chamber, such as a gas sensor, because the additional materials would

increase fluorine consumption and the resulting contaminants that Hoffman desires to avoid.

In addition, it is respectfully noted that during operation of the lasers proposed by Hoffman and Ishihara, fluorine gas is depleted due to its reactive nature. For this reason, the teachings of Ishihara propose monitoring fluorine concentration. However, xenon is an inert gas, and xenon gas is not depleted in the invention claimed on appeal or in the device proposed by Hoffman. Since xenon gas is not depleted, there is no motivation within the teachings of Hoffman and Ishihara to monitor xenon concentration within the laser chamber, along the lines proposed by Ishihara for monitoring fluorine. Therefore, these teachings cannot motivate one of ordinary skill in the art to add a xenon sensor to device proposed by Hoffman in order to arrive at the invention claimed on appeal.

As mandated in *Ashland Oil Company, Inc. v. Delta Resins Factories*, 227 USPQ 657, 667 (Fed. Cir. 1985), the decision maker must provide a factual basis for the legal conclusion of obviousness as follows:

To properly combine references A and B to reach the conclusion that the subject matter of a patent would have been obvious, case law requires that there be some teaching, suggestion, or inference in either reference A or B or both, or knowledge generally available to one of ordinary skill in the relevant art, which would have lead one skilled in the art to combine the relevant teachings of references A and B. [citations omitted] The decisions maker's determination as to what

objective evidence in reference A or B, or both, or knowledge generally available to one of ordinary skill in art is the nature of a factual finding.

The decision maker, however, after making findings as to the objective evidence, must subjectively analyze these factual findings to determine whether the teachings of references A and B could have been combined. Thus, the ultimate determination as to whether references could have been combined in a legal conclusion.

The *Ashland Oil* court also obligated the decision maker to explain the decision, by setting forth the teachings from the references that were relied on as a factual basis in reaching the conclusion of obviousness. The Court stated:

The District Court did not elucidate any factual teachings, suggestions, or incentives from this prior art that show the propriety of combination, nor in fact did the District Court even point out what teachings from each of the references, when considered in combination, were relied upon in concluding that the invention of claim 10 would have been obvious. Nor apparently did the District Court give any consideration to teachings in those references which would have lead one of ordinary skill in the art away from the invention of claim 10. We would have to say that the District Court used claim 10 of the '797 Patent as a blue print and abstracted individual teachings from the Rothrock patent, Megson, and Maktin to create the Pep resin of claim 10. [citation omitted] This was error as a matter of law. (emphasis added) In support of the above, the Court cited the cases of *ACS Hospital*

Systems v. Montefiore Hospital, 221 USPQ 929, 933 (Fed. Cir. 1985); *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303, 311, 312 (Fed. Cir. 1983); and *In re Sernaker*, 217 USPQ 1, 5 (Fed. Cir. 1983), which have frequently been cited by the Federal Circuit for supporting the above well-established principles.

Applicant respectfully submits that the final rejection of their claims does not elucidate any factual teachings, suggestions or incentives from the teachings of Hoffman and Ishihara, showing the propriety of the combination of these teachings. Further, the examiner has not given any consideration to the teachings in these references which would have lead one skilled in the art away from the invention as defined in appellant's claims. Accordingly, applicant respectfully submits that the examiner has not comply with the mandate set forth in *Ashland Oil*. Moreover, the examiner has failed to satisfy his burden of establishing a *prima facie* case of obviousness by showing some objective teaching or generally available knowledge that would lead one skilled in the art to combine the teachings of the cited references. See *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988). For such reasons, applicant respectfully submits that the examiner's decision rejecting their claims under 35 U.S.C. §103 constitutes an unsupported, arbitrary and erroneous legal conclusion of obviousness.

6. The data in applicant's specification disclosure showing unexpected results for the invention claimed on appeal rebuts any alleged *prima facie* case of obvious over the teachings of Hoffman and/or Ishihara.

The teachings of Hofmann propose at column 7, line 30, that "The energy is lower with Xe over the entire range." See Fig. 8B of Hoffman. Fig. 8A of Hoffman shows a laser output exhibits a tendency of decrease with addition of

Xe. These teachings in Hoffmann are opposite to the presently claimed invention, where energy output is maximized at about 10 ppm Xe in the laser gas. Furthermore, the teachings of Hoffman are completely silent with respect to minimizing energy dispersion at about 10 ppm Xe in the laser gas, as required in applicant's claims.

The most pertinent teachings of Hoffman concerning amounts of xenon appear at three different portions thereof. These include the following discussions:

(1) Column 2, lines 33-34:

Tests performed show substantial improvements in energy stability with the addition of about 30 ppm of Xenon to a KrF laser. Tests show improved performance for the ArF lasers with the addition of about 6-10 ppm of Xe or 40 ppm of Kr.

(2) Column 9, lines 45-49:

Without the additives the average 3 sigma for the laser was about 5 %. About 6-10 ppm of Xe reduced 3 sigma to above for 4% (a 20% improvement). [This is for an ArF laser.] For the same improvement with Kr about 40 ppm were required.

(3) Column 10, lines 27-30:

Recommended ranges of Xe for KrF lasers is less than about 30 to 40 ppm. Recommended ranges of Kr for ArF lasers is less than about 40 ppm and recommended Xe ranges is less than about 10 ppm.

These discussions in the teachings of Hofmann do not contemplate or suggest an excimer laser output control method used in an excimer laser,

where the xenon contained within the gas mixture in an amount of about 10 ppm **both** maximizes an output energy of the oscillated pulsed laser and minimizes a dispersion of the output energy of the oscillated pulsed laser, as required in the claims on appeal.

The present applicant discovered that approximately 10 ppm of Xe gas in the laser gas mixture is effective for actually increasing energy of the laser output. See Fig. 3 of the present application. This is surprising and unexpected in view of the teachings of Hoffmann. All of the claims on appeal define either a method step or structure for controlling the concentration of xenon gas in the laser gas mixture to an amount of approximately 10 ppm, which amount effectively reduces the bursting and spiking phenomena in the pulsed laser output while also increasing energy of the pulsed laser output.

As shown in Fig. 3 of the present application, the applicants discovered the point that the laser output becomes maximum and the point that a dispersion of the output energy becomes a minimum are both with the addition of 10 ppm of Xe. The teachings of Hoffman do not contemplate or suggest achieving both maximum output and minimum dispersion at 10 ppm of Xe, as opposed to other amounts of Xe, such as the amounts of 6 and 40 ppm proposed therein. For example, Fig. 8A of Hoffman shows that the laser output is gradually decreased in proportion to the increase in the concentration of Xe.

Applicant respectfully submits that the discovery of maximum output and minimum dispersion of the laser by use of about 10 ppm of Xe in the laser gas mixture is unexpected, and thus unobvious from the teachings of Hoffman. Since the teachings of Ishihara have absolutely no discussion therein concerning xenon, the unexpected advantages of using about 10 ppm of Xe in the laser gas mixture must necessarily distinguish the invention claimed on appeal from the teachings of Ishihara.

Applicant respectfully submits that the showing of improved properties as shown in Fig. 3 of the present application concerning the maximum output and a minimum dispersion using about 10 ppm of xenon in the laser gas demonstrates substantially and unexpectedly improved results, which are described in applicant's specification as remarkable. Therefore, applicant respectfully submits that the showing in Fig. 3 of the present application and the statements in the present specification are sufficient to establish unexpected results and thereby distinguish the presently claimed invention from the teachings of Hoffman. *In re Soni*, 54 F.3d 746, 34 USPQ2d 1664 (Fed. Cir. 1995).

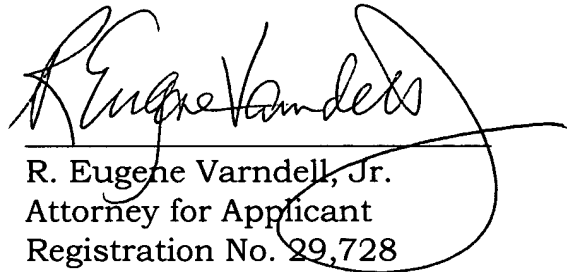
In response to the aforesaid arguments, the examiner stated that Hoffman teaches the unexpected advantages achieve by the presently claimed invention, e.g. the amounts of xenon gas in the laser gas mixture. Firstly, as

discussed above, the teachings of Hoffman never contemplate or suggest the use of approximately 10 ppm of Xe gas in the laser gas mixture is effective for actually increasing energy of the laser output, while minimizing dispersion of output energy. At best, Hoffman proposes the use of a much wider range of Xe gas in the laser gas mixture (6-10 ppm, 30 ppm, and 40 ppm) compared to the narrow limitation of approximately 10 ppm of Xe required in the claims on appeal. Applicant discovered that the narrow range of approximately 10 ppm of Xe required in the claims on appeal unexpectedly maximizes an output energy of excimer laser while minimizing a dispersion of the output energy. The teachings of Hoffman do not discuss these properties, and especially do not discuss these properties in connection with concentrations of xenon. Therefore, it is impossible for the teachings of Hoffman to remotely contemplate the unexpected advantages of the presently claimed invention.

XII. CONCLUSION

For the foregoing reasons, applicant (appellant) respectfully submits that examiner's decision rejecting the claims on appeal under the provisions of 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a) constitutes unsupported, arbitrary, and erroneous conclusions of fact and law. Therefore, it is respectfully requested that this honorable Board reverse the rejection of claims 40-44 and 49-52 as being anticipated under 35 U.S.C. 102(e) by Hofmann and the rejection of claims 45-48 under 35 U.S.C. § 103(a) over the teachings of Hoffman in view of Ishihara.

Respectfully submitted,
VARNDELL & VARNDELL, PLLC
(formerly Varndell Legal Group)



R. Eugene Varndell, Jr.
Attorney for Applicant
Registration No. 29,728

Atty. Case No. VX992028
106-A South Columbus Street
Alexandria, Virginia 22314
(703) 683-9730
V:\Vdocs\W_Docs\Oct04\P052-2028 AB.doc

A P P E N D I X

40. An excimer laser comprising a chamber device, a gas mixture sealed in the chamber device, the gas mixture being composed of a rare gas selected from the group consisting of Kr and Ar, a buffer gas of Ne, and a halogen gas, gas supply means for supplying the mixture gas to the chamber device, and means for carrying out pulse oscillation in the chamber device by discharges across discharge electrodes to excite the gas mixture to oscillate a pulsed laser; wherein a predetermined amount of xenon gas having a concentration of approximately 10 ppm is supplied from xenon gas supply means to the gas mixture in the chamber device, whereby the chamber device operates to maximize an output energy of excimer laser and minimize a dispersion of the output energy.

41. An excimer laser comprising a chamber device, a gas mixture sealed in the chamber device, the gas mixture being composed of a rare gas selected from the group consisting of Kr and Ar, a buffer gas of Ne, and a halogen gas, gas supply means for supplying the mixture gas to the chamber device, and means for carrying out pulse oscillation by discharges across discharge electrodes to excite the gas mixture to oscillate a pulsed laser;

wherein an amount of xenon gas is supplied from the gas supply means and previously mixed in the gas mixture and sealed into the gas supply means, so that when the gas mixture is supplied into the chamber device, the gas mixture sealed within the chamber device has a xenon concentration of approximately 10 ppm, so that the xenon contained within the gas mixture maximizes an output energy of oscillated pulsed laser and minimizes a dispersion of the output energy of the oscillated pulsed laser.

42. An excimer laser output control method used in an excimer laser, which comprises:

a step of sealing a gas mixture within a chamber device, the gas mixture including a rare gas selected from the group consisting of Kr and Ar, a buffer gas of Ne, and a halogen gas by supplying the mixture gas from gas supply means;

a xenon gas supplying step of supplying a predetermined amount of xenon gas into the chamber device in which the gas mixture was sealed, so that the gas mixture sealed in the chamber device has a xenon concentration of approximately 10 ppm; and

a step of carrying out pulse oscillation in the chamber device by discharge across discharge electrodes to excite the gas mixture to oscillate pulsed laser, so that the xenon contained within the gas mixture maximizes an output energy of the oscillated pulsed laser and minimizes a dispersion of the output energy of the oscillated pulsed laser.

43. An excimer laser output control method according to claim 42 further comprising:

a step of sealing the xenon gas to be supplied to the chamber device to a xenon gas supply means; and

a concentration sensing step of detecting the concentration of xenon gas added to the gas mixture in the chamber device,

wherein during the xenon gas supplying step, a supply amount of the xenon gas sealed in the xenon gas supply means and supplied to the chamber device is controlled so that the concentration of the xenon gas detected in the concentration sensing step becomes approximately 10 ppm of the gas mixture.

44. An excimer laser output control method used in an excimer laser chamber device, which comprises:

a step of preparing a gas mixture composed of a rare earth gas selected from the group consisting of Kr and Ar, a buffer gas of Ne, and a halogen gas;

a xenon gas mixing step of supplying a predetermined amount of xenon gas into the gas mixture and mixing the predetermined amount of xenon gas with the gas mixture, so that the gas mixture contains approximately 10 ppm of xenon gas;

a supply step of supplying the gas mixture containing approximately 10 ppm of xenon gas to the chamber device;

a sealing step of sealing the gas mixture containing approximately 10 ppm of xenon gas in the chamber device; and

an oscillation step of carrying out pulse oscillation in the chamber device by discharge across discharge electrodes to excite the gas mixture, whereby the approximately 10 ppm of xenon gas in the gas mixture maximizes an output energy of oscillated pulsed laser and minimizes a dispersion of the output energy of the oscillated pulsed laser.

45. An excimer laser according to claim 40, wherein the gas supply means includes an xenon sensor means for detecting an amount of xenon within the chamber device, and a controller for controlling the amount of xenon supplied to the chamber device based on the detected amount of xenon in the chamber device by the xenon sensor means.

46. An excimer laser according to claim 41, wherein the gas supply means includes an xenon sensor means for detecting an amount of xenon

within the chamber device, and a controller for controlling the amount of xenon supplied to the chamber device based on the detected amount of xenon in the chamber device by the xenon sensor means.

47. An excimer laser output control method according to claim 42, further includes a step of detecting an amount of xenon within the chamber device by xenon sensor means, and a step of supplying a controlled amount of xenon to the chamber device based on the detected amount of xenon in the chamber device by the xenon sensor means.

48. An excimer laser output control method according to claim 44, further includes a step of detecting an amount of xenon within the chamber device by xenon sensor means, and a step of supplying a controlled amount of xenon to the chamber device based on the detected amount of xenon in the chamber device by the xenon sensor means.

49. An excimer laser according to claim 40, wherein the rare gas is Kr.

50. An excimer laser according to claim 41, wherein the rare gas is Kr.

51. An excimer laser output control method according to claim 42, wherein the rare gas is Kr.

52. An excimer laser output control method according to claim 44, wherein the rare gas is Kr.